Spring 2004

Physics 137B Section 1: Problem Set #7
Due: 5PM Friday March 19 in the appropriate dropbox inside 251 LeConte (the "reading room")

Suggested Reading for this Week:

- Bransden and Joachain (B&J) Sections 9.1-9.4
- I've posted some notes on Fermi's Golden Rule on our web page. So far, we have covered pages 1 through 6 of this note. We'll cover the rest after Spring Break.

Homework Problems:

1. B&J 9.1
2. B&J 9.3
3. B&J 9.8 Note: since you have not been asked to do problem 9.2, don't bother to do the comparison.
4. Equation 10 of the handout on Fermi's Golden rule gives the expression for the β-decay rate.
   (a) Using the assumption that our electrons are ultra-relativistic and in the limit where we can ignore the electron mass (so that $E_e = p_e c$) derive Equation 11 of the handout starting from Equation 10.
   (b) The lifetime for particle decay is given by $\tau = 1/W$ where W is the decay rate calculated using Fermi's Golden rule Assuming $|\mathcal{M}| \sim 1$ and using $G_F/(\hbar c)^3 = 10^{-5}$ GeV^{-2} predict the lifetime of the muon, which decays as follows: $\mu^- \to e^- \overline{\nu}_e \nu_\mu$